

**What is Claimed is:**

1. An integrated metal processing facility for forming and heat treating metal castings, comprising:

a pouring station for pouring a molten metal into a series of molds  
to form the castings;

a heat treatment unit including at least one heat treatment station  
for heat treating the castings;

a transfer system for moving the castings from said pouring station  
to said heat treatment unit, and

a heat source positioned along a path of travel for the castings for  
applying heat to the castings prior to introduction of the  
castings into said heat treatment station to maintain the  
castings at or above a process control temperature for the  
metal of the castings;

whereby as the castings are moved from said pouring station to  
said heat treatment unit, the molten metal of the castings is  
permitted to solidify while the castings are maintained at or  
above their process control temperature until the castings  
are introduced into said heat treatment station.

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2. The integrated metal processing facility of claim 1 and wherein said transfer system comprises a robotic or mechanized arm adapted to grip and move the molds with the castings therewithin from the pouring station to said heat treatment station.
3. The integrated metal processing facility of claim 1 and wherein said heating source comprises a heating element mounted to said transfer system for applying heat to the castings during transfer from said pouring station to said heat treatment line.
4. The integrated metal processing facility of claim 1 and further comprising a process temperature control chamber positioned adjacent an inlet end of said heat treatment station.
5. The integrated metal processing facility of claim 4 and wherein process temperature control station comprises a radiant chamber through which the castings are moved and wherein said heat source comprises a series of heating elements mounted along said process temperature control station for supplying heat to said radiant chamber.
6. The integrated metal processing facility of claim 5 and wherein said heating elements comprise radiant heaters.

7. The integrated metal processing facility of claim 5 and wherein said heating elements comprise convection heaters.
8. The integrated metal processing facility of claim 5 and wherein said heating elements comprises a series of burners connected to a fuel supply.
9. The integrated metal processing facility of claim 1 and wherein said heat treatment line comprises a furnace having a plurality of furnace chambers each defining a heat treatment station.
10. The integrated metal processing facility of claim 1 and wherein said heat treatment line further includes a process temperature control station comprising an elongated chamber through which the castings are received prior to their introduction into said heat treatment station, and a plurality of heat sources supplying heat to said chamber to create a heated environment therein, in which cooling of the castings is arrested and the castings are maintained at or above the process control temperature therefore.

11. A method of forming and treating a metal casting, comprising:
  - pouring a molten metal into a mold;
  - allowing the molten metal within the mold to cool to a temperature sufficient to enable the molten metal to solidify to form the casting;
  - arresting the cooling of the casting and maintaining the casting at or above a process control temperature for the metal of the casting as the casting is moved into a heat treatment station of the heat treatment line; and
  - heat treating the casting.
12. The method of claim 11 and wherein arresting the cooling of the castings and maintaining the casting at or above the process control temperature comprises applying heat to the casting at the temperature sufficient to arrest the cooling of the casting without heating the casting above a solution heat treatment temperature for the metal of the casting.
13. The method of claim 12 and wherein arresting the cooling of the casting and maintaining the casting at or above the process control temperature comprises moving the casting through a radiant chamber having a series of heating sources mounted therein for applying heat to the casting.



14. The method of claim 13 and wherein the heat source comprises radiant heaters radiating heat toward the castings.
15. The method of claim 13 and wherein the heat sources comprise convection heaters that direct a flow of a heated media toward the castings.
16. The method of claim 11 and wherein transferring the casting comprises removing the casting from its mold and thereafter moving the casting from the pouring station to the heat treatment line.
17. The method of claim 11 and wherein transferring the casting comprises engaging the mold with the casting contained therewithin with a transfer mechanism and moving the casting from the pouring station to an inlet conveyor for the heat treatment line.
18. The method of claim 17 and wherein arresting the cooling of the casting comprises directing heat from a heat source mounted to the transfer mechanism toward the casting as the casting and mold are transferred to the heat treatment line.
19. The method of claim 11 and further comprising loading the casting into a basket for heating the casting in a batch of castings.

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20. The method of claim 13 and further comprising directing waste gasses and heat from the radiant chamber into the heat treatment station.
21. The method of claim 11 and wherein arresting the cooling of the casting comprises applying heat to the casting during the transfer of the casting from the pouring station to the heat treatment line.
22. The method of claim 11 and further comprising removing a chill from the mold prior to heat treating the casting.
23. A system for processing castings formed from a molten metal, comprising:
  - a pouring station in which the molten metal is poured into a series of molds to form the castings; and
  - a heat treatment line downstream from said pouring station and including:
    - at least one heat treatment furnace through which the castings are passed for heat treatment thereof; and
    - a process temperature control station positioned upstream from said heat treatment furnace and having a chamber through which the castings are passed prior to heat treatment, and a series of heating elements for applying

heat to the castings within said chamber sufficient to arrest cooling of the castings at or above a process control temperature for the metal castings.

24. The system of claim 23 and further comprising a transfer mechanism for transferring the castings from said pouring station to said heat treatment line.
25. The system of claim 23 and wherein said heating elements comprise radiant heaters.
26. The system of claim 23 and wherein said heating elements comprise convection heaters.
27. The system of claim 23 and wherein said heating elements comprises a series of burners connected to a fuel supply.
28. The system of claim 23 and wherein said chamber comprises an elongated tunnel having a ceiling and side walls including a radiant material for directing heat toward the castings as the castings are passed therethrough.

29. The system of claim 24 and further comprising a heat source mounted to said transfer mechanism and adapted to applying heat to the castings during transport of the castings from said pouring station to said heat treatment line.
30. The system of claim 23 and wherein said heat treatment line comprises a furnace having a plurality of furnace chambers each defining a heat treatment station.
31. The system of claim 23 and further including a collection tray for receiving the castings from the pouring station and reciprocally moveable into and out of said process temperature control station as successive castings are placed therein.

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